Spot Safety Project Evaluation

Project Log # 200704301

Spot Safety Project # 05-00-223

Spot Safety Project Evaluation of the Installation of a Traffic Signal at the Intersection of SR 1613 (Davis Drive) and SR 1635 (Koppers Rd/McCrimmon Parkway) Wake County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 11/6/2007
Brad Robinson, EI Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-00-223 – The Intersection of SR 1613 (Davis Drive) and SR 1635 (Koppers Rd/McCrimmon Parkway) in Wake County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a traffic signal.

The subject location is a four-leg intersection which was controlled by stop signs on SR 1635 (Koppers Rd/McCrimmon Parkway) in the before period. SR 1613 (Davis Dr) has a thru-right and a left turn lane on each apporach. After reviewing the crash reports for the subject location it was observed that SR 1635 had only a single approach lane in the before period, but at approximately the same time the signal was installed left turn lanes were added for both approaches. From aerial photos is appears that existing pavement was used to mark the turn lanes. The speed limit for SR 1613 is 55 mph and is not posted for SR 1635.

The original statement of problem was that traffic volumes had increased to the point where motorists could not safely maneuver through the intersection. A signal warrant investigation was conducted and it was determined that the intersection satisfied traffic signal warrants 2, 6, 9, and 11.

The initial crash analysis was conducted from August 1, 1997 to July 31, 2000 with a total of 10 reported crashes, five of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 24, 2002 with a total cost of $40,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from December 1, 2001 to March 31, 2002. The before period consisted of reported crashes November 1, 1996 through November 30, 2001 (5 years and 1 month) and the after period consisted of reported crashes from April 1, 2002 through April 30, 2007 (5 years and 1 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	35	22	-37.1
Total Severity Index	3.96	6.13	54.8
Target Crashes	29	10	-65.5
Target Crash Severity Index	4.57	11.54	152.5
Volume	15,100	20,600	36.4
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	1	N/A
Class B Crashes	3	0	-100.0
Class C Crashes	11	5	-54.5
PDO Crashes	21	16	-23.8

The naive before and after analysis at the treatment location resulted in a 37 percent decrease in Total Crashes, a 66 percent decrease in Target Crashes, and a 36 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 37 percent decrease in Total Crashes and a 66 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period despite a large increase in ADT.

Referencing the above table and the *Collision Diagrams*, it is apparent that the installation of the traffic signal helped to reduce Frontal Impact Crashes at the subject intersection. There was a large pattern of Frontal Impact Crashes between eastbound SR 1635 vehicles and southbound SR 1613 vehicles (14 crashes) that was nonexistent in the after period. There was also a pattern of Frontal Impact Crashes between westbound SR 1635 vehicles and northbound SR 1613 vehicles (9 crashes) that was reduced by 67 percent in the after period to only three crashes.

One Frontal Impact Crash pattern that increased from the before to the after period was Left Turn-Same Roadway Crashes involving a southbound SR 1613 driver turning left onto SR 1635. This pattern increased 100 percent, from 2 in the before period to 4 in the after period. This increase can probably be attributed to the large increase in traffic (36%).

The large increases in the Severity Indexes are misleading. There was a single “A” injury crash in the after period, which was also a Target Crash. The crash was a Left Turn-Same Roadway Crash. Injury crashes of all other types decreased from the before to the after period.

The calculated benefit to cost ratio for this project is –7.52 considering total crashes. The benefit to cost ratio considering only target crashes is –6.97. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of roadway.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1613 at SR 1635 BY: Brad Robinson
COUNTY: Wake DATE: 10/31/2007
FILE NO.: SS 05-00-223

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$40,000	10	0.149	$5,961
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$40,000	10	0.149	$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,861
TOTAL COST OF PROJECT= $40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.08	0	0.00	14	2.76	21	4.13	$69,311
AFTER	5.08	1	0.20	5	0.98	16	3.15	$135,945

Annual Benefits from Crash Cost Savings ($66,634)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($75,495)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -7.52

TOTAL COST OF PROJECT - $40,000 COMPREHENSIVE B/C RATIO - -7.52

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1613 at SR 1635 BY: Brad Robinson
COUNTY: Wake DATE: 10/31/2007
FILE NO.: SS 05-00-223 Target

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$40,000	10	0.149	$5,961
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$40,000	10	0.149	$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,861
TOTAL COST OF PROJECT= $40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.08	0	0.00	13	2.56	16	3.15	$61,535
AFTER	5.08	1	0.20	4	0.79	5	0.98	$123,327

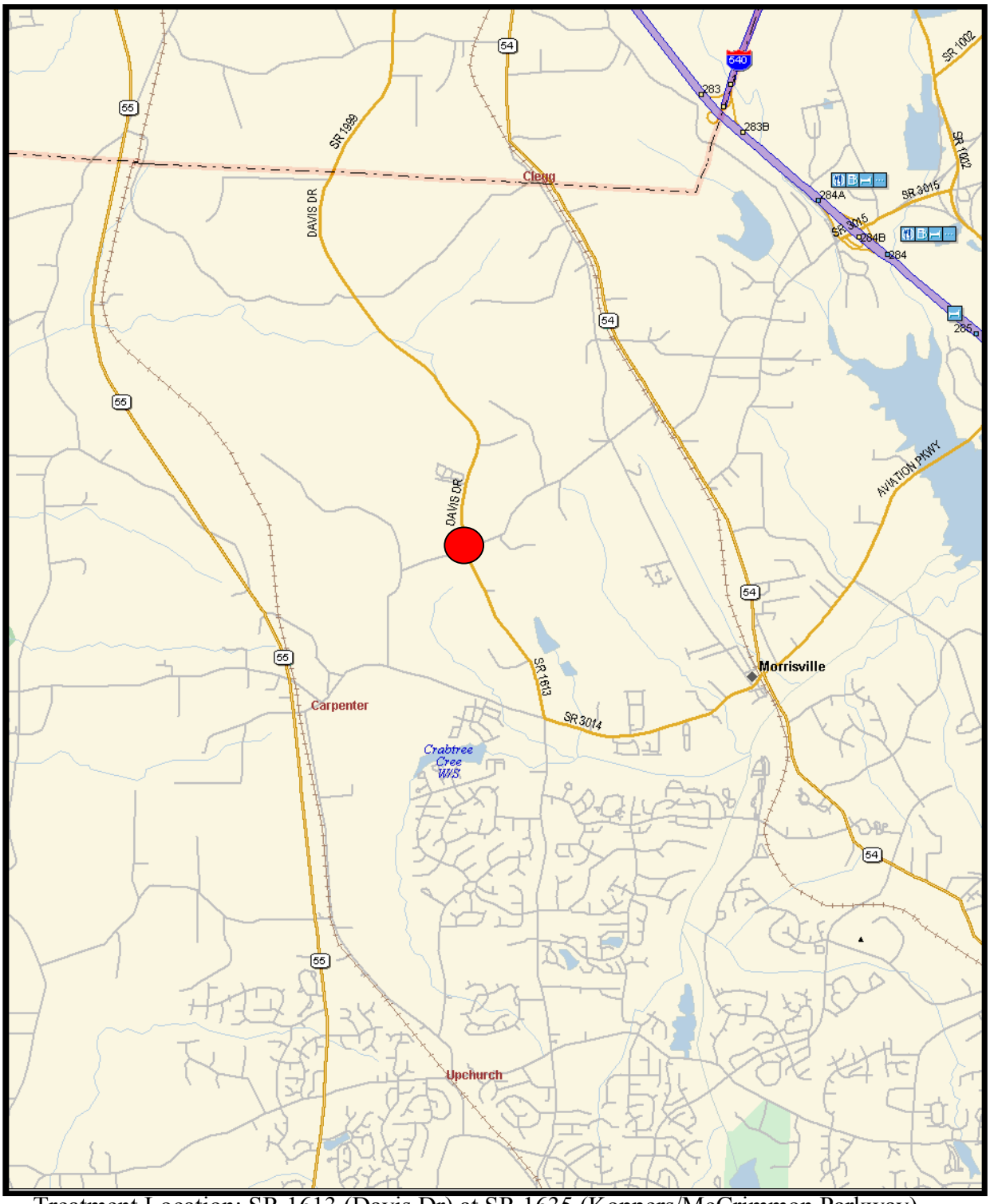
Annual Benefits from Crash Cost Savings ($61,791)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($70,653)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -6.97

TOTAL COST OF PROJECT - $40,000 COMPREHENSIVE B/C RATIO - -6.97

Location Map
Wake County
Evaluation of Spot Safety Project #05-00-223



Treatment Location: SR 1613 (Davis Dr) at SR 1635 (Koppers/McCrimmon Parkway)

Treatment Site Photos Taken October 19, 2007

Driving Eastbound on SR 1635 (Koppers Rd)

Driving Eastbound on SR 1635 (Koppers Rd)

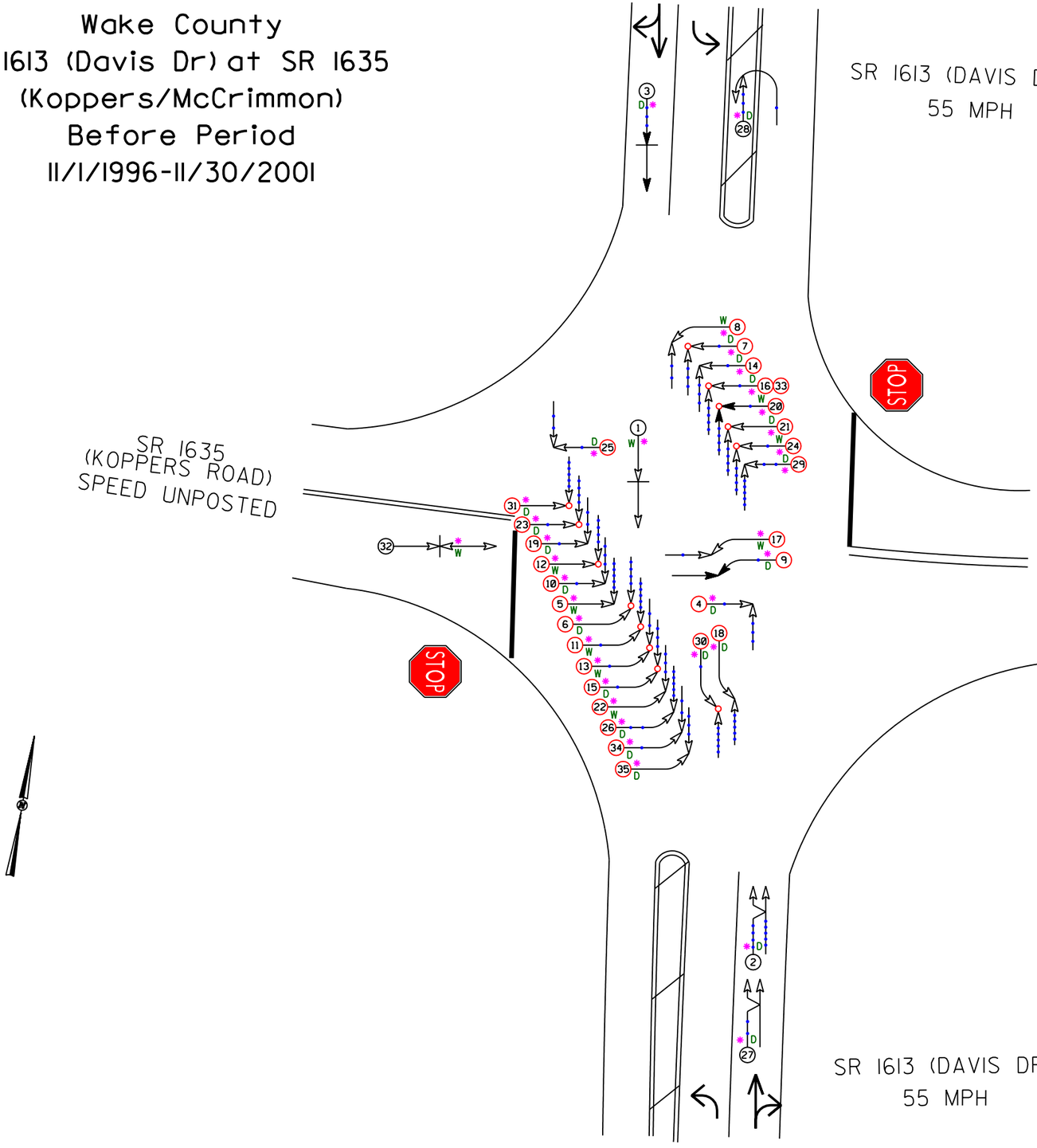
Driving Westbound on SR 1635 (McCrimmon Pkwy)

Driving Westbound on SR 1635 (McCrimmon Pkwy)

Looking North on SR 1613 (Davis Dr)

Driving South on SR 1613 (Davis Dr)

Wake County
SR 1613 (Davis Dr) at SR 1635
(Koppers/McCrimmon)
Before Period
11/1/1996-11/30/2001



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

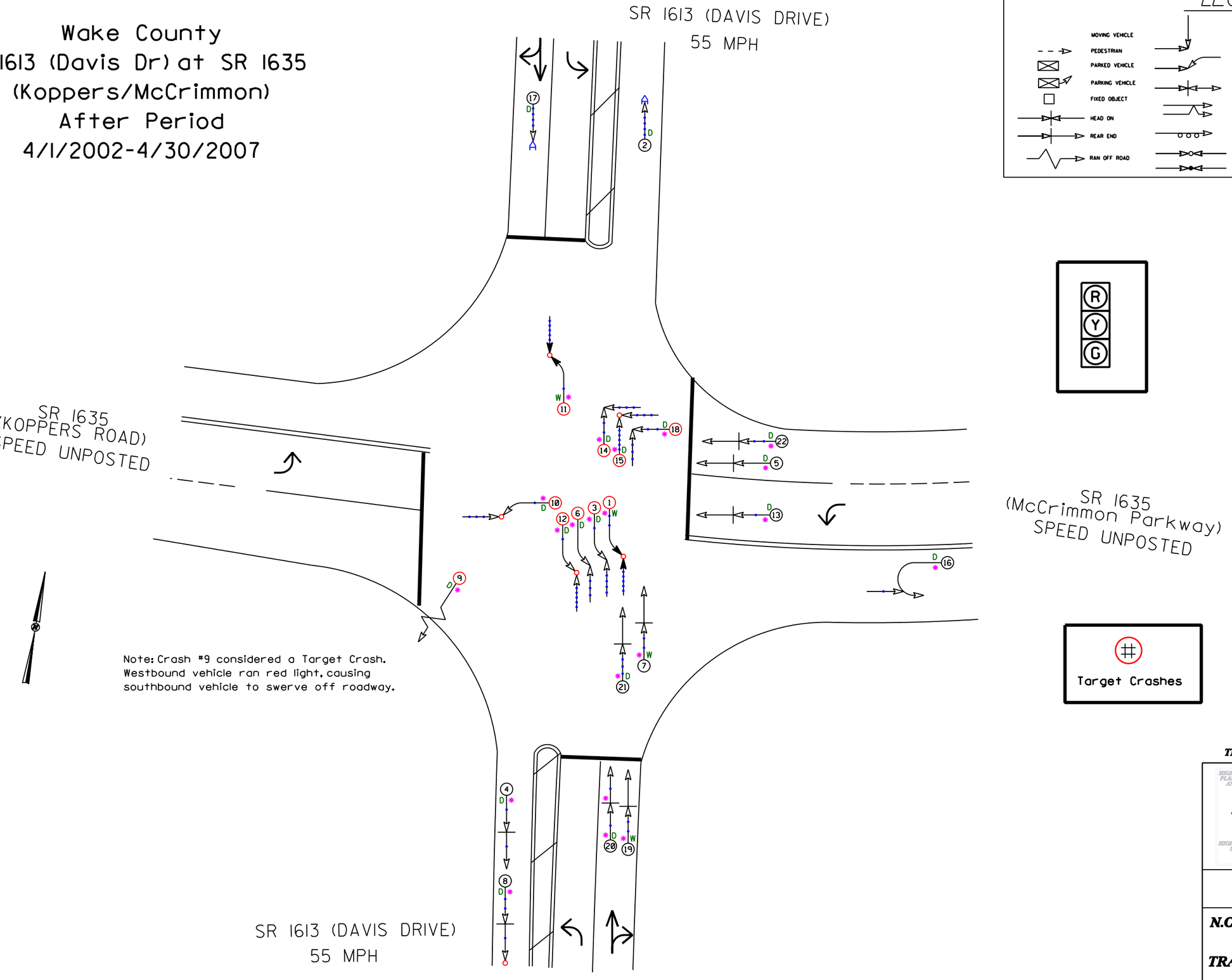
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 5	AREA:
STUDY PERIOD: 11/1/1996 TO 11/30/2001	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY: BDR	
SCALE: NOT TO SCALE	
DATE: October 2007	
LOG NUMBER: 20070430I	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Wake County
SR 1613 (Davis Dr) at SR 1635
(Koppers/McCrimmon)
After Period
4/1/2002-4/30/2007



Note: Crash #9 considered a Target Crash. Westbound vehicle ran red light, causing southbound vehicle to swerve off roadway.

LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
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60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
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O OILY

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 5	AREA:
STUDY PERIOD: 4/1/2002 TO 4/30/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY: BDR	
SCALE: NOT TO SCALE	
DATE: October 2007	
LOG NUMBER: 20070430I	

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